2 November 1947.

Dr. N. H. Giles, jr.,
Clinton Laboratories,
Oak Ridge, Tennessee.

Dear Dr. Giles,

You may be interested in an expression which predicts the dosage of a mutagen which should be most effective in reversion experiments where the absolute number of mutants is as much a consideration as their proportion among the survivors.

With low rates of mutation, p_m, the proportion of mutants should be $p_m = k_m \cdot d$, where k_m is the rate at which mutations are induced and d is the dose. The survival ratio, $n_s \div n_o$ is

$n_s/n_o = e^{-k_s d}$, where k_s is the rate of killing. The absolute number of mutants is then $p_m n_s$ or:

$$n_m = k_m d n_o e^{-k_s d}.$$

By setting $\frac{dn_m}{dd} = 0$, the function can be maximized.

We have:

$$0 = k_m n_o e^{-k_s d} + k_m d n_o (-k_s) e^{-k_s d}.$$

This cancels out to $0 = 1 - k_s d$, or $d = 1/k_s$. This is defined as the dose which corresponds to a survival ratio of 1/e, or 36.8% survival, ie, 63.2% killing.

Esther tells me that that this approximates closely to the dosage which was found to be most successful in the inositol-less experiments.

We have just begun to get to work again, here at Madison. Hope to see you at Chicago. Best regards to Mrs. Giles.

Yours sincerely,

Joshua Lederberg,
Ass't Professor of Genetics.